Hello BMACers,
July is here and with it, hot and miserable weather. I enjoy the holidays during the summer for the most part, but I cannot stand the hot, humid heat that comes with it. Even if it is clear on one of these nights, it is usually too hot and muggy to go out and observe or image our beautiful night sky. One good thing about it already being July is that we are one step closer to that awesome weekend in October that is StarFest. I know I always seem to bring it up every month in this article, but it is a blast and I along with a few other people are always looking forward to it. If you are one of these people, feel free to join along with the countdown to StarFest as I do.

At our meeting this month, we will not be having a speaker. July is our annual picnic and it will again be at Natural Tunnel State Park in Duffield, VA. The picnic will be on July 16th and start at 6:00 PM and go until you decide to leave. It will, as always, be at the gazebo toward the back of the park. We would like for everyone to bring a dish to share and definitely bring a chair. There is no seating at the gazebo. The Park Association will provide drinks, paper goods, and ice. If you would like to bring a telescope or binoculars, please do so. We will be holding a public star party for the campers in the park. We do this every year since the park lets us use their gazebo at no charge. If the weather is good, we can probably expect to see quite a few campers up on top of the hill. There are other events going on in the park earlier that day that will draw a big crowd so what better way to conclude their day than a nice view of the night sky. We always have a good time every year during this picnic. Come on out, bring the family, and enjoy good food, good company, and good conversation.

At our meeting in June, we featured a presentation given by William Troxel. Will is one of our club members and former club chairman. His presentation was entitled, “Astronomy & The Ancient Indigenous Peoples of the Americas.” He started his presentation talking about how he became interested in the ancient peoples and how his research has led to wonderful friendships with some of the descendants of the different Indian cultures. Will then gave a brief overview of the role that Astronomy played in the day to day lives of the Ancient Indigenous Peoples of the Americas. He talked about 3 different Indian cultures, the Pueblos (Anasazi), Mayans, and the Incans. He showed us the different names that the different tribes gave the stars and constellations and what they believed they meant. I really enjoyed Will’s presentation and I believe others did as well. Thank you Will for your wonderful presentation and I look forward to the updates in your research in the future.

At the business portion of the meeting, we held the election for the next year’s club chairman. I was re-elected to continue as your chairman. Of course, no one ran against me, but I like to think that the members still wanted me in this position. I do want to thank everyone for letting me be your chairman and I do plan to continue to be the best one that I can be. I really hope we can continue to grow the club and have good presentations to share.

Our constellation this month is Ophiuchus. It is a large constellation located around the celestial equator. Its
name is translated from the Greek "serpent-bearer," and it is commonly represented as the God Apollo grasping a snake that is represented by the constellation Serpens. Ophiuchus was one of the 48 constellations listed by the astronomer Ptolemy. It is also one of the 88 modern constellations. The most well-known star in this constellation is Barnard's Star. It is a red dwarf about six light-years away from Earth. The most interesting fact is that it is the fourth-closest known individual star to our Sun and it is the closest star in the Northern Hemisphere. This constellation has a ton of deep-sky objects. Some of which include IC 4665, NGC 6633, M9, M10, M12, M14, M19, M62, and M107. All of the objects are star clusters. My favorite part of this constellation is the multiple star system Rho Ophiuchus. It is by far one of my favorite things to image in the night sky. See one of my images of the star system in this issue.

So, next time you are out enjoying our wonderful night sky, point your scope, binoculars, or your camera to Ophiuchus and get lost in the wonders of this constellation.

That will do it for this month. Please remember that the SunWatches will still occur every Saturday and Sunday from 3:00-3:30 p.m. if it is clear and we are always happy to have volunteers from the club to help out with this too. If you would like to help out, please arrive about 30 minutes early to help set up the equipment. I hope to see everyone at the picnic this month. It is definitely worth the trip up and we may just get some info on this year’s StarFest. You never know what we will find out. Until next month... Clear Skies.

[Ed. Note: As I am away from my desk when this issue needs to be published, a simpler version of this document is being created remotely.]
Image of Rho Ophiuchus by Brandon Stroupe
Portion of star chart from Taki Toshimi’s Mag 6 Star Charts showing Ophiuchus.
Map of Natural Tunnel State Park - Notice that the Gazebo is in the upper right corner. It is the solid black hexagon with the large, white "G."
BMAC Notes

Scopes for sale! The Bristol Astronomy Club is helping a lady whose husband had been a telescope collector. The following images are from Tom Rutherford, Chair of the Bristol club. You can contact him about purchasing any of these scopes.

sternwachter@netscape.net
Star Stuff
by Terry Alford

Ol’ Sol is continuing to calm down. Around June 10 I spent some time late in the afternoon viewing the Sun with my little H-alpha scope. There were about a half dozen smallish prominences scattered across the northern edge of our star but absolutely no sunspots or filaments or any other signs or solar activity. Solar minimum is definitely on its way. On July 4, our Independence Day, the Earth will be at aphelion, the farthest from the Sun at a little over 94.5 million miles.

Mercury will become visible in the low western sky towards the latter half of the month. The fastest planet will be only 1/2° from Venus shining at –1.1 magnitude and will show a gibbous phase.

Venus also returns to the western sky and will be very bright at –3.9 mag. At first Venus and Mercury will be very close but that will soon change. By the last week Mercury will be 5° east of Venus.

Jupiter is still a dominating object in the low western sky. It has dimmed to mag –1.9 and the disk is shrunk to 33” wide. Try to observe it as early as you can find it in the evening twilight.

Mars is still a very bright object in the southern sky although it will dim from -1.4 to -0.8 mag and shrink in size from 16” to 13” by the end of the month. Still the Red Planet is still large and bright enough to give up some decent telescopic views, especially early in the month. It is in a gibbous phase.

Although Saturn dims a little during the month from +0.1 to +0.3 it is still a marvelous sight in our telescopes. It is actually in Ophiuchus but only 6° above Antares, the brightest star in Scorpius. The ring system is still tilted very favorably to our point of view. Mars, Jupiter and Saturn should all be favorites at the picnic/star party at Natural Tunnel State Park on July 16.

Neptune is back in the evening sky in Aquarius and reaches the meridian around daybreak. Uranus rises late in the evening and is best observed before morning twilight.

Normally I don’t write anything about Pluto since it has been downgraded from planetary status (I still disagree with that decision made by the International Astronomical Union!). But it is at opposition this month and will get fainter in the future. Currently it is around mag +14.3 and thus you will need a large scope 12-inches or larger and a good finder chart to spot it. It is located in Sagittarius.

The Moon is full on July 4th and full on the 19th.
The Queen Speaks
Happy Birthday Nikola Tesla
by Robin Byrne

This month, we celebrate the life of a man who revolutionized the world of electricity. Nikola Tesla was born in Smiljan, Croatia on July 10, 1856 (although he may have celebrated it on June 28 since Croatia had not yet converted to the Gregorian calendar at the time). Tesla’s father was a priest, but his mother was a bit of an inventor, creating tools and mechanical appliances for the home. She also was able to memorize large amounts of material, a skill Tesla inherited with a photographic memory.

Tesla began going to school at the age of five. The following year, the family moved to another town, where Tesla completed his primary education. Tesla attended the equivalent to high school in Karlovac at the Higher Real Gymnasium. It was here that his skill with mathematics began to shine, including the ability to perform integral calculus in his head. In 1873, at the age of 17, Tesla graduated, and promptly came down with a severe case of cholera. His father was so worried, despite wanting Nikola to follow in his footsteps into the priesthood, instead promised to send Nikola to engineering school if he got better.

Before Tesla could go to college, he ran into another obstacle: the draft. To avoid being conscripted into the Austro-Hungarian Army, Tesla went into hiding in the mountains. The experience helped him to regain his strength, and offered the opportunity to read many books. By 1875, he felt safe to return to society, and entered the Austrian Polytechnic in Graz. It was here that Tesla’s work ethic became obvious, studying from 3:00 a.m. to 11:00 p.m. seven days a week. His professors feared he would kill himself with this schedule. However, by his third year, his behavior had changed as he became addicted to gambling, and lost all of his money. He never did graduate. Tesla moved to Maribor to hide from his family because he had dropped out of school. In 1879, Tesla was arrested for not having a residence permit, and was essentially deported back home. He took a job teaching at his old school until two of his uncles paid his way to Prague to continue his studies. Since he didn’t meet the school’s prerequisites, Tesla just sat in on the classes, learning all he could.

In 1881, Tesla moved to Budapest to be the chief electrician at the Budapest Telephone Exchange. Some of his first inventions were created here, though none were patented. The following year, he moved to France to work at the Continental Edison Company, once again creating new and better equipment designs.

In 1884, Tesla moved to New York City with just a few items of clothing, and not much else. A friend of his, Charles Batchelor, wrote a letter introducing Tesla to Edison, in which he said, “I know two great men, one is you and the other is this young man.” Edison hired Tesla to work at the Edison Machine Works, initially as an electrical engineer, but later making use of his ingenuity to solve more difficult problems. Edison asked Tesla to redesign their direct current generators, purportedly saying, “There’s fifty thousand dollars in it for you—if you can do it.” A few months later, Tesla came back with a much improved design. When he asked about the money, Edison said he had only been joking, but offered a
Nikola Tesla

Image from Wikipedia, public domain
$10 per week raise, instead. Tesla was furious, and quit. With the financial backing of two investors, Tesla created his own business, Tesla Electric Light & Manufacturing. Tesla’s first U.S. patents came from equipment he designed while here. However, while Tesla wanted to create new and interesting electrical equipment, his investors just wanted it to be a utility company. They ultimately forced Tesla out, even leaving him without rights to his patents, since they were filed in the name of the company. Once again broke, Tesla took on a variety of jobs, from ditch digger to electrical repair. He was at the lowest point of his life.

Tesla then met two men who wanted to help him with backing for a new company, the Tesla Electric Company. Unlike his previous backers, these men were interested in developing patents on new designs and inventions. They even provided a laboratory in which Tesla could work. In less than a year, Tesla had created an induction motor that ran on alternating current. The following year, Tesla demonstrated his motor at a meeting of the American Institute of Electrical Engineers. Word of his design reached George Westinghouse, who was very interested. A deal was made for Westinghouse to have a license to the motor and transformer designs, for $60,000, plus royalties of $2.50 per AC horsepower produced by each motor (They would later regret the royalty deal, and had to buy the patents for $216,000 to save on future expenses.). Tesla was also hired on as a consultant to design an alternating current power system for running streetcars. Ultimately, he developed alternating current systems of motors, generators, and transformers.

Meanwhile, Edison was pushing his direct current system as the way to power cities. In what became known as the “War of Currents,” Edison tried to convince the public that alternating current was dangerous. The problem with direct current was that it grew weak so quickly, power stations would need to be located every 2 miles along a transmission line. Alternating current could travel much farther. That decided the fate, and alternating current became the standard.

In 1891, Tesla became a U.S. citizen and started his own laboratory in New York City. Within the year, he had patented the Tesla coil, and had shown how to light lamps through a wireless power transmission system. The wireless system became Tesla’s obsession, wanting to distribute power through the air, and he even proposed using similar technology to transmit communications wirelessly. At the 1893 World’s Columbian Exposition in Chicago, while Westinghouse was demonstrating the wonders of alternating current, Tesla was demonstrating his wireless power system under the title of “Tesla Polyphase System.” One result of the Exposition was Tesla recommending a two-phase AC system to the people who were wanting to harness Niagara Falls to produce power. Westinghouse Electric got the contract to build the generator, based on Tesla’s advice. Tesla designed the plant, the first hydroelectric power plant in the U.S., which came on line two years later, providing all of the power for Buffalo, New York.

Continuing with his interest in wireless electronic transmissions, Tesla built a radio-controlled boat in 1898. He wanted to sell the design to the military for use controlling torpedoes, but they weren’t interested. The following year, Tesla moved to Colorado Springs, Colorado so that he would have more open space to continue working with high-voltage, high-frequency
To my illustrious friend Sir William Crookes of whom I always think and whose kind letters I never answer!

June 17, 1901

Nikola Tesla
inventions. Also, he had friends at the power distribution center there who offered to provide him with free electricity. Tesla studied lightning, to try to understand its electrical properties. He then created artificial lightning, with discharges as long as 135 feet and packing millions of volts. Thunder from these discharges were heard 15 miles away. He even knocked out a power station. The receivers Tesla built to study lightning also picked up signals that Tesla thought were from aliens. He was sure they were counting out “1 … 2 … 3 ….” Coincidentally, at the same time, Marconi was testing his transmitter using Morse code of the letter S, which is three dots.

Tesla left Colorado in 1900, and continued his work on electrical transmitters, for which he filed several patents. Then Marconi made his radio transmission across the Atlantic. Tesla claimed it was all done with equipment he, himself, had designed. This was the beginning of a patent battle between the two that wasn’t resolved until 1943, when the Supreme Court upheld Tesla’s patents.

Meanwhile, Tesla was on to his next big project, to build the Wardenclyffe Tower in Shoreham, New York on Long Island. He wanted a bigger and better transmitter for his experiments. The problem was funding. Tesla tried to get J. P. Morgan to back him. Morgan provided the initial funds, but denied any further assistance. Despite the lack of funds, Tesla built a 187 foot tower, which he claimed would be used for both wireless communication and wireless power transmission. It never came to fruition.

Among others of Tesla’s ideas, he claimed that applying electricity to
the brain would enhance intelligence. The superintendent of New York City Schools seriously considered wiring classroom walls to bombard students with electric waves. Tesla also proposed a device using electric rays, for locating submarines - essentially he was describing radar. The ultimate inventor of radar, Girardeau, noted that Tesla’s ideas were right, but that he just didn’t have the technology to do it.

It was around this time that Tesla suffered a nervous breakdown. After that, he mostly worked as a consultant and spent his free time feeding pigeons in the park. In 1934, after hearing of Tesla’s decline, Westinghouse Electric started paying Tesla $125 per month plus covering his rent. This continued until Tesla’s death. Tesla’s ideas became more and more bizarre, even claiming to have designed a “death ray” capable of destroying 10,000 enemy airplanes from 200 miles away. Nikola Tesla died of coronary thrombosis on January 7, 1943 in his room at the New Yorker Hotel. He was 86 years old. Two thousand people attended his funeral. In 1960, he was honored by the General Conference of Weights and Measures when they named the unit for magnetic flux density the “Tesla.”

The owner of roughly 300 patents, the creator of so many of the electrical devices used today, Nikola Tesla was a remarkable man. On July 10, now known as Nikola Tesla Day in many states, flip your lights on and off in memory of a genius.

References:
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Tesla’s Biography - Tesla Memorial Society
http://www.teslasociety.com/biography.htm
When isolated stars like our Sun reach the end of their lives, they're expected to blow off their outer layers in a roughly spherical configuration: a planetary nebula. But the most spectacular bubbles don't come from gas-and-plasma getting expelled into otherwise empty space, but from young, hot stars whose radiation pushes against the gaseous nebulae in which they were born. While most of our Sun's energy is found in the visible part of the spectrum, more massive stars burn at hotter temperatures, producing more ionizing, ultraviolet light, and also at higher luminosities. A star some 40-45 times the mass of the Sun, for example, might emit energy at a rate hundreds of thousands of times as great as our own star.

The Bubble Nebula, discovered in 1787 by William Herschel, is perhaps the classic example of this phenomenon. At a distance of 7,100 light years away in the constellation of Cassiopeia, a molecular gas cloud is actively forming stars, including the massive O-class star BD+60 2522, which itself is a magnitude +8.7 star despite its great distance and its presence in a dusty region of space. Shining with a temperature of 37,500 K and a luminosity nearly 400,000 times that of our Sun, it ionizes and evaporates off all the molecular material within a sphere 7 light years in diameter. The bubble structure itself, when viewed from a dark sky location, can be seen through an amateur telescope with an aperture as small as 8" (20 cm).

As viewed by Hubble, the thickness of the bubble wall is both apparent and spectacular. A star as massive as the one creating this bubble emits stellar winds at approximately 1700 km/s, or 0.6% the speed of light. As those winds slam into the material in the interstellar medium, they push it outwards. The bubble itself appears off-center from the star due to the asymmetry of the surrounding interstellar medium with a greater density of cold gas on the "short" side than on the longer one. The blue color is due to the emission from partially ionized oxygen atoms, while the cooler yellow color highlights the dual presence of hydrogen (red) and nitrogen (green).

The star itself at the core of the nebula is currently fusing helium at its center. It is expected to live only another 10 million years or so before dying in a spectacular Type II supernova explosion.

This article is provided by NASA Space Place. With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology. Visit spaceplace.nasa.gov to explore space and Earth science!
Image credit: NASA, ESA, and the Hubble Heritage Team (STScI/AURA), of the Bubble Nebula as imaged 229 years after its discovery by William Herschel.
### BMAC Calendar & More

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<tr>
<th>Date</th>
<th>Time</th>
<th>Location</th>
<th>Notes</th>
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<tbody>
<tr>
<td><strong>BMAC Meetings</strong></td>
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<tr>
<td>Friday, August 5, 2016</td>
<td>7 p.m.</td>
<td>Nature Center</td>
<td>Program: TBA; free.</td>
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<td>Discovery Theater</td>
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<tr>
<td>Friday, September 2, 2016</td>
<td>7 p.m.</td>
<td>Nature Center</td>
<td>Program: TBA; free.</td>
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<td>Discovery Theater</td>
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<tr>
<td><strong>SunWatch</strong></td>
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<tr>
<td>Every Saturday &amp; Sunday</td>
<td>3-3:30 p.m.</td>
<td>At the dam</td>
<td>View the Sun safely with a white-light view if clear.; Free.</td>
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<td>March - October</td>
<td>if clear</td>
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<tr>
<td><strong>StarWatch</strong></td>
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<td>October 1, 8, 15, 2016</td>
<td>7:30 p.m.</td>
<td>Observatory</td>
<td>View the night sky with large telescopes. If poor weather, an alternate live tour of the night sky will be held in the planetarium theater.; Free.</td>
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<td>Oct. 22, 29, Nov. 5, 2016</td>
<td>7:00 p.m.</td>
<td>Observatory</td>
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<td>November 12, 19, 26, 2016</td>
<td>6:00 p.m.</td>
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<td><strong>Special Events</strong></td>
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<td>Saturday, July 16, 2016</td>
<td>6 p.m. till</td>
<td>Natural Tunnel State Park,</td>
<td>Annual club picnic. BMACers and their families are most welcome to enjoy the evening at the gazebo along with a potluck dinner and stargazing for the Park’s campers. Please bring a dish to share. You’ll need to bring your own chair and telescope to share the night sky.</td>
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<td>nighttime</td>
<td>VA</td>
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<td>October 21-23, 2016</td>
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<td>Farmstead Museum, BMP</td>
<td>StarFest. Our annual astronomy convention/star gathering for the Southeast United States. Three days of astronomy fun, 5 meals, 4 keynote speakers, unique T-shirt, and more. Pre-registration with full payment is necessary for attendance. Sorry, no walk-ins nor “visits.” Registration opens in August.</td>
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Bays Mountain Astronomy Club Newsletter July 2016
Annual Dues:

Dues are supplemented by the Bays Mountain Park Association and volunteerism by the club. As such, our dues can be kept at a very low cost.

$16 /person/year

$6 /additional family member

Note: if you are a Park Association member (which incurs an additional fee), then a 50% reduction in BMAC dues are applied.

The club’s website can be found here:

www.baysmountain.com/astronomy/astronomy-club/
Footnotes:

1. The Rite of Spring

Of the countless equinoxes Saturn has seen since the birth of the solar system, this one, captured here in a mosaic of light and dark, is the first witnessed up close by an emissary from Earth … none other than our faithful robotic explorer, Cassini.

Seen from our planet, the view of Saturn’s rings during equinox is extremely foreshortened and limited. But in orbit around Saturn, Cassini had no such problems. From 20 degrees above the ring plane, Cassini’s wide angle camera shot 75 exposures in succession for this mosaic showing Saturn, its rings, and a few of its moons a day and a half after exact Saturn equinox, when the sun’s disk was exactly overhead at the planet’s equator.

The novel illumination geometry that accompanies equinox lowers the sun’s angle to the ring plane, significantly darkens the rings, and causes out-of-plane structures to look anomalously bright and to cast shadows across the rings. These scenes are possible only during the few months before and after Saturn’s equinox which occurs only once in about 15 Earth years. Before and after equinox, Cassini’s cameras have spotted not only the predictable shadows of some of Saturn’s moons (see PIA11657), but also the shadows of newly revealed vertical structures in the rings themselves (see PIA11665).

Also at equinox, the shadows of the planet’s expansive rings are compressed into a single, narrow band cast onto the planet as seen in this mosaic. (For an earlier view of the rings’ wide shadows draped high on the northern hemisphere, see PIA09793.)

The images comprising the mosaic, taken over about eight hours, were extensively processed before being joined together. First, each was re-projected into the same viewing geometry and then digitally processed to make the image “joints” seamless and to remove lens flares, radially extended bright artifacts resulting from light being scattered within the camera optics.

At this time so close to equinox, illumination of the rings by sunlight reflected off the planet vastly dominates any meager sunlight falling on the rings. Hence, the half of the rings on the left illuminated by planetshine is, before processing, much brighter than the half of the rings on the right. On the right, it is only the vertically extended parts of the rings that catch any substantial sunlight.

With no enhancement, the rings would be essentially invisible in this mosaic. To improve their visibility, the dark (right) half of the rings has been brightened relative to the brighter (left) half by a factor of three, and then the whole ring system has been brightened by a factor of 20 relative to the planet. So the dark half of the rings is 60 times brighter, and the bright half 20 times brighter, than they would have appeared if the entire system, planet included, could have been captured in a single image.

The moon Janus (179 kilometers, 111 miles across) is on the lower left of this image. Epimetheus (113 kilometers, 70 miles across) appears near the middle bottom. Pandora (81 kilometers, 50 miles across) orbits outside the rings on the right of the image. The small moon Atlas (30 kilometers, 19 miles across) orbits inside the thin F ring on the right of the image. The brightnesses of all the moons, relative to the planet, have been enhanced between 30 and 60 times to make them more easily visible. Other bright specks are background stars. Spokes -- ghostly radial markings on the B ring -- are visible on the right of the image.

This view looks toward the northern side of the rings from about 20 degrees above the ring plane.

The images were taken on Aug. 12, 2009, beginning about 1.25 days after exact equinox, using the red, green and blue spectral filters of the wide angle camera and were combined to create this natural color view. The images were obtained at a distance of approximately 847,000 kilometers (526,000 miles) from Saturn and at a Sun-Saturn-spacecraft, or phase, angle of 74 degrees. Image scale is 50 kilometers (31 miles) per pixel.

The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. The Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, manages the mission for NASA’s Science Mission Directorate, Washington, D.C. The Cassini orbiter and its two onboard cameras were designed, developed and assembled at JPL. The imaging operations center is based at the Space Science Institute in Boulder, Colo.

Image Credit: NASA/JPL/Space Science Institute